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ABSTRACT

The need for educational reform is argued, based on a growing awareness of the general ineffectiveness of school for most children. Alternative educational programs based on behavioral analysis are judged inadequate, because they are based upon the same inappropriate goals as traditional education. In order to make educational reform effective, it must be recognized that (1) education must be perceived as a broad sweep of actual service to children, and (2) the task of education is not to directly prepare children to compete successfully in the adult world, but to be competent children. The High-Scope Curriculum, based on Piagetian theory and concerned with creating opportunities for maximal cognitive development, is presented as a viable educational approach. The curriculum incorporates Piaget's positions on action, representation, and language. It is prepared for teachers who are trained to put into action a theoretically-based program with broad developmental goals. A sequence of classification exercises is considered useful in structuring classroom activities and delineating constructive directions for each child. Such a sequence, directly based on Piaget's experiments, is presented. (DP)

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CLASSIFICATION IN THE HIGH/SCOPE COGNITIVE CURRICULUM*

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Introduction

Education today faces its most critical challenge since it became available to all citizens as a matter of national policy. The challenge stems from the growing realization that the failure of compensatory education to alter the performance patterns of disadvantaged children is an indication of a general ineffectiveness in education for most children. In recent testimony before the House General Education Subcommittee, Alfred McElroy, Chairman of the National Advisory Council on Education of Disadvantaged Children, stated, "The ultimate extrapolation of the works of Moynihan and Jencks is not only the failure of compensatory education, but the morose conclusion that 'school is dead'."

That "school is dead" is fairly widely agreed upon by many innovators involved in broad educational efforts today. The solutions being explored are derived from a broad-ranging search into various mechanical and theoretical alternatives, many suspiciously like the image of the original form. The most loudly discussed and widely followed alternative is actually a commitment to reinstate the old values of traditional education in the highly technical format of programmed learning accompanied by appropriate behavior modification techniques. The basic educational goals of this approach were summarized by John Dewey in 1938 (Dewey 1938):

> "The main purpose or objective is to prepare the young for future responsibilities and for success in life, by means of acquisition of the organized bodies of information and prepared forms of skill which comprise the materials of instruction. Since the subject-matter as well as standards of proper conduct are handed down from the past, the attitude of pupils must, upon the whole, be one of docility, receptivity, and obedience. Books, especially textbooks, are the chief representatives

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> of the lore and wisdom of the past, while teachers are the organs through which pupils are brought into effective connection with the material. Teachers are the agents through which knowledge and skills are communicated and rules of conduct enforced.
>
> "The traditional scheme is, in essence, one of imposition from above and from outside. It imposes adult standards, subject-matter, and methods upon those who are only growing slowly toward maturity. The gap is so great that the required subject-matter, the methods of learning and of behaving are foreign to the existing capacities of the young. They are beyond the reach of the experience the young imposed; even though good teachers will use devices of art to cover up the imposition so as to relieve it of obviously brutal features." (pp. 18-19)

The "devices of art" that good teachers will use are of a multitude these days. They range from the clever kindergarten teacher in Los Angeles who dresses as a clown and uses hand puppets to "interest the children in phonetics" to the highly stylized programmed learning studies now underway. Daniel Zwerdling reports on a program run by The Institute for Behavioral Research in a public junior high school in Maryland (1973):

> "In the Academic Skills Center students work individually at 'study stations,' plowing through self-paced math and English texts. Students punch out on the time clock to spend some of their hard-earned reinforcement points. 'The average student can earn 100, maybe 150 points a day . . .' They use their points to buy certain rewards. The most valued reward is time away from class.
>
> "Unacceptable social behavior can bring heavy fines. 'That's really mostly for very serious misbehavior, . . . for example, complete balking at work. Or swearing.' Touching staplers . . . also loses points.

This project fulfills Dewey's description of the student's role as one of "docility, receptivity, and obedience," and of the role of education as "in essence, one of imposition from above and outside," except that students do work individually and at their own pace.

As a solution to the pressing social problem for educational

reform, it is unlikely that these attempts at mechanized solutions will work across the broad stream of education. For example, there will not be a better format to teaching reading. Diederich (1973) in a recent paper, based on a massive and comprehensive Office of Education survey, stated that reading research for the last decade found "no significant differences in the results of different methods." Further, he stated:

> "The national reading problem is not that massive numbers of students cannot read in the sense of not knowing graphemephoneme correspondences but that many persons do not wish to read for pleasure or information and do not comprehend either written or oral messages well.
>
> "In effect, the national reading problem might just as easily be called the national thinking or comprehension problem, . . . massive numbers of our citizens are, essentially, not inclined to develop or maintain reading and comprehension skills necessary for their own self-selected goals and life space."

The Office of Economic Opportunity found that when firms offering contract performance procedures, usually programmed instruction, were tested under experimental conditions they could not produce more "effective" outcomes than most "typically" taught classes. And, of course, "typically" taught classes don't work either.

Fundamentally two issues must be accepted in order to make educational reform effective: 1) the recognition that education must be perceived as a broad sweep of actual service to children, and 2) the recognition that the task of education is not to directly prepare children to compete successfully in the adult world but to be competent children.

1. Education is not reading, writing, and arithmetic. The academic skills and specific content knowledge of traditional education are the <u>outcome</u> of education, not the process. Education is a process of human interaction that includes such diverse areas as problem solving, social relationships, cooperation, competition, planning, pride, self-control, self-awareness, aesthetic judgment, and self-criticism, among other things; it means learning things that can be best learned at one age, such as how to go to sleep at night deeply happy with your new pet mouse, or to experience the intense development of the ability to predict -- such important things as movements of the earthworm across the wet pavement or frogs

swimming in the pond, or the reaction of peers to a new rule in the game. Roles and role playing, tolerance for a wide range of competencies and behaviors, capacity to help others and assume momentary responsibility for the interactions underway are central issues. In short, education has little to do with the so-called three R's; it has much to do with providing broad opportunity at the various levels of development the young child experiences.

What is the value of education? As Piaget (1970) stated, "Is the culture that counts in any particular individual always that which results from the specifically scholastic part of his education (once the detailed knowledge acquired at final examination level has been forgotten), or is it the culture his school managed to develop in him through incentives or interests stimulated independently of what at that time appeared to be the essential part of his so-called basic education?" (p. 6)

To bring the problem closer to home, the data from the first two years of National Follow Through were presented at the recent AERA convention in New Orleans (Sorenson, 1973). As graph after graph was displayed on the wall, the report discussed the impact of National Follow Through on the participating children in relation to control groups. By the time the excellent discussants were presenting their opinions of the outcomes, all were talking as though this complex educational program with its unheard of reach into schools, communities, and families had been evaluated by a few rote memory academic tests. Even when less "traditional" data were available, the analysis of "value" of National Follow Through rested upon such academic skill performance. The general acceptance of broader goals for education, when reduced to measurement, uniformly turn out to be standardized achievement tests. It doesn't have to be that way.

2. The second issue is the role of education and the adult world. Traditionally, education has been thought to be the time for children to learn the skills of adults. In primitive tribes, the young take on miniature adult roles in hunting, gardening, and various sex-related roles that they see their elders employ. (See Cole, Gay, Glick, and Sharpe for an especially clear example, 1971, pp. 38-43.) In our society adult tasks of balancing a checkbook (normally poorly done, incidentally), communication with written words, reading for job applications, and various tasks that require a basic literacy, etc., are seen as necessary preparation goals. Given the technical repetitive skills of many occupations and the limited range of necessary academic skills, it is a possible task to break these down into rules that can be taught children -- when two vowels go walking the first one does the talking.

Indeed, with sophisticated behavioral engineering to design the steps and with clever behavioral analysis techniques to induce the child to attend, amazing things can be taught to very young children. Some things like the Suzuki method can be used to teach music, some new reading methods can teach bright two-year-olds and rather dull three-year-olds to "read" almost to the point of demonstrating independent reading capacity. Yet this is a major problem. For while the child is learning these things, what else is happening?

One of the recent New York Times reports on an allegedly successful Follow Through program in New York City using behavioral analysis methods with token reinforcement commented that a criticism of the method was that all the children did was reading and math, no time was permitted for other areas or activities. Undoubtedly an oversimplification of the teaching program, but such feelings served the basis for the cancellation of many contract performance agreements. Basically there is little doubt that we have the technical skills to teach almost anything to anyone. Just give us the time.

The problems of education are more deeply embedded than that. Massive change is called for which cannot be answered by adding a new degree to the teacher training sequence, a new gadget to those gathering dust in the closet, or a new scientific study group to those already functioning. It is this challenge the High/Scope Foundation is most interested in and where our work is focused.

Cognitive Curriculum to Achieve Massive Change

The High/Scope Foundation is dedicated to the development of effective alternative methods in education through carefully sequenced research and development projects followed by dissemination and field testing in a range of national sites. Programs underway include an infant, preschool, and early elementary education. Basic to the development of these components of the High/Scope Cognitively Oriented Curriculum has been two consistent assumptions: 1) that the child development theories of Piaget provide an effective and organized base for evolving curriculum, and 2) that the observation and experience of teachers and others actually conducting programs with children provide the firm reality that, in the last analysis, curriculum must serve. In order to accomplish this goal a number of steps or stages have occurred in our curriculum development. Some of these steps are now marked by various publications (Weikart, Rogers, Adcock, and McClelland, 1971; Lambie and Weikart, 1971; Weikart and Lambie, 1968; etc.) and a series of publications now in

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preparation recording our development at the infancy, preschool, and early elementary levels. However, certain current assumptions we use can be outlined as basic to all phases of the High/Scope curriculum.

Piagetian Ideas We Employed in the Cognitive Curriculum

Action. Principal to our work is the inclusion of action as a central condition to learning. This commitment throws our curriculum clearly in opposition to the programmed learning approaches, and permits us to operate with the assumption that learning occurs only through the participatory experience of the learner and not through the didactic program of a teacher. Learning must be wrested by the active learner from real experience with real materials, objects, events, locations, etc., rather than from prepared and artificial contrived occasions. This means classrooms must have ample tools, objects, and time for exploration and drawing conclusions. We feel that wrong answers are as important to learning as correct ones. The key is the process. Such action occurs within a context, however, and that context is derived for the child by the teacher based upon her understanding of child development, culture of the child, personality, etc., in short the instructional theory of the curriculum.

This focus on action and experience by the child gives precedence to the use of natural materials, it minimizes the use of commercial materials and "kits," and it enables the "classroom" to move into molds very different from the traditional. The teacher must also learn actively through training and supervision which respects the same principles as the child's learning.

Representation. A second major principle is the concept of representation. This broad system of organization for events ranging from the object level to the sign level creates a highly important conceptual tool for a teacher planning an operation and a very convenient educational oriented diagnostic method of viewing the child. Classroom experiences can be organized to "match" these levels which make sense to teachers and can be easily replicated. In Cali, Colombia, in an outstanding preschool project operated by Dr. Sinisterra and Arlene and Harrison McKay, teachers with minimal public school background successfully organized field trips and "local" experiences which they use as the basis for children's action in the classroom by drawing upon various levels of representation.

Language. Another area of importance is Piaget's position on language. Our program does not "teach" language. When we are asked to describe our language stimulation program we are always

at a loss, for we see language as the outcome of both a forceful maturational process and of the action the child has produced in his engagement with the environment. Teachers accompany his action with language, but the principal language we are interested in is the child's description and articulation of his rich experiences in his environment. If the action is occurring, the language will result.

Reality Based on Observation and Experience of Teachers

Perhaps most important for us has been the fact that Piagetian theory hammered into reality by teachers and children in action has allowed us to find a content for education without falling into the trap of simply attempting to accomplish the same old educational goals with some sugar coating. The commitment to broad cognitive process development as a legitimate outcome of education rather than the specific academic skills as proposed by the more traditional orientation has helped us to organize school very differently. Teacher guidance has been essential for our curriculum development.

Before taking classification as an example of such content, we would like to make a statement about the purpose of education from our point of view. We are an open-framework approach, what Larry Kohlberg might philosophically call a cognitive-developmental approach. As such we do not see the purpose of education to accelerate the learner into more advanced stages of what might look like knowledge, but to broaden the experience base of each child within the intellectual and developmental framework he has. As the child has the maturational ability to "grow," it is the environment which provides him with the breadth of experience necessary to produce the consolidation of his growth so that each stage evolves from a rich and accessable base rather than a limited and ungeneralized one. This means that each age of the child must be capitalized upon for the unique intellectual and developmental qualities it provides the child. Simple "growth" to the next stage will occur, the issue is to make the cognitive complexity as rich and deep as possible.

Our problem in society is not the lack of individuals with various intellectual abilities, but the narrow reach of those abilities. Education and child development activities must create the occasion for the full development of the child to his individual limits. Only through this will society as a whole have the necessary human resources to serve all people.

Classification Exercises

We began the task of finding methodologies for classroom use by selecting a sequence of classificatory behaviors that would serve as characteristic guideposts in the child's development. We drew heavily upon the interviews described in Piaget and Inhelder's The Early Growth of Logic in the Child (Inhelder and Piaget, 1964) for a a list of classificatory behaviors (see Table 1). This list served as a basis for familiarizing ourselves with situations and materials in which classification activities were possible and as a guide to the interpretation of our own experiences with children.*

On the basis of the behaviors listed in Table 1, our experience with children and the needs of our overall curriculum design, we wrote a sequence of classification goals, or exercises, for children. These statements are intended as general descriptions of classification and classification related behavior to identify the range of such behaviors children could be expected to exhibit and to provide the basis of sequencing expectations teachers could have of their children.

Exercise 1: Identifying an object that does not belong in a set.

In his study of singular classes Piaget shows that very young children as well as non-human subjects can identify the object that is different in a set of identical objects (Inhelder and Piaget, 1964, p. 120). For example, at clean-up time children enjoy finding the knife that doesn't belong among the spoons in the house area, or the blue block that doesn't belong amohg the natural wood ones. Although the task may be performed at an early age, the young child does not understand the relations involved until he is capable of concrete operations.

Exercise 2: Identifying an object that is the same (identical).

This task can also be accomplished with a minimal understanding of the relationships involved. Only two objects need be related. The child merely needs to find another object he can assimilate to the same schema he employed for the first. He does not have to find more objects that are related in the same way.

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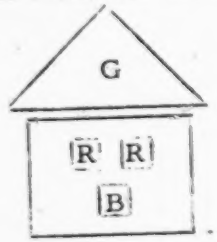
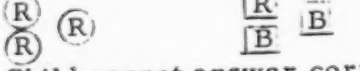
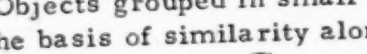
*High/Scope operates a Staff Training and Curriculum Development Center which houses programs for children 3 to 11 years old.

Table 1

CHARACTERISTIC CLASSIFICATORY BEHAVIORS

3-4 yrs.	5-6 hrs. II	7-8 yrs. III	10-12 yr.
Stage of graphic collections and allignments. Objects grouped to form an object (house or bus) or linked together in a string in which successive pairs are similar but criterion changes  Complex object allignment	Stage of non-graphic collections. 1. Objects grouped in small groups on the basis of similarity alone.  2. Child cannot answer correctly the question, "Are all the squares blue?" 3. When asked to produce two groups (dichotomize) child understands the second group as "the others" but does not relate them to the first group, e.g., "roses and the others" rather than "roses and flowers other than roses." (Correct) 4. Not-class such as not-red-squares or not-triangles are referred to part of what is left.	Child can correctly answer "all" and "some" questions.  a) Are all the circles blue? b) Are there more squares or blue? Child relates the "others" to the first group according to class inclusion. Not-classes referred to all of the not-triangles left or to a segment of the remainder close to the red square class, e.g., blue squares or red circles. Child can add new objects to an existing classification and change groups as needed. Child can organize objects into hierarchical classifications such as ducks-birds other than ducks-animals other than birds-objects. These are based on class inclusion. Child can sort (dichotomize) using one criterion and re-sort using another.

Exercise 3: Finding an object that is the same in some way (alike, similar).

The problem of constructing relationships of similarity is made more explicit to the child when he is confronted with objects that share some but not all properties. In this situation he must focus on specific attributes rather than react to global impressions. For example, he may be asked to find a partner wearing clothes similar to his, or to find an object similar to a block he is using to build a house.

Exercise 4: Finding an object that is not the same (different).

When the child is able to construct relations of similarity he can also negate these relations and thus construct relations of difference. Note the fact that young children will often use a similar object when asked for something that is different indicates that young children often conceive different as "not quite the same." For example, a child asked to find something different from a wrench might bring a bigger wrench from the work bench.

Exercise 5: Saying how objects are identical, similar, different.

Although a verbal component accompanies each activity in which the child is engaged, this exercise is included to make explicit the need for children to verbalize their thinking. In this case the child attaches verbal labels to relations of similarity which he has previously constructed without explicit use of language. Language enables the child to express relationships which he has first experienced through action.

Exercise 6: Grouping two or more objects the child using his own criteria.

During early sorting experiences children often construct relations of similarity in which the criteria for similarity shift from one pair of objects to the next. Young children also substitute part-whole spatial considerations for criteria of similarity, when grouping objects together to make a "house," "face" or other composite object (Inhelder and Piaget, 1964, Chap. 1).

As the child's thinking progresses to a period in which he groups in non-graphic collections, the child easily finds and combines similarity relations. The child combines several relations of "the same color," for example, as he sorts a pile of crayons before placing them back on the shelf. However, the child can be quite random in relating one group of objects to another. He may also leave some objects ungrouped because he cannot find the all-embracing criteria necessary to include them in a group.

Exercise 7: Sorting all the objects in a group and accounting for all.

This exercise requires the child to find sufficient criteria to group all objects. Opportunity for this may occur at clean-up time when he must place all the objects in available containers and decide whether a three dimensional shape goes with the blocks or the two dimensional pieces.

Exercise 8: Sorting all the objects in a group into two sets (dichotomizing).

Dichotomizing puts greater constraints on the process of finding criteria for similarity than the free grouping experiences in exercises six and seven. The child may find a subset of the whole and simply place "the other" in a separate group, or he might construct a class and its complement from a set of wood, plastic and metal rectangles -- metal and not-metal.

None of the essential characteristics of class inclusion is required to dichotomize. It is not required that the groups so formed be included in a larger whole. A child may answer incorrectly that there are more metal pieces than rectangular pieces when the metal rectangles outnumber the non-metal rectangles.

Exercise 9: Sorting and re-sorting objects using different criteria. Re-sorting when new objects are added to the group.

This exercise requires children to be very flexible in their use of criteria in grouping. No explicit inclusion is required although successive consideration of several criteria foreshadows the use of simultaneous schema characteristic of the stage of concrete operations. Children often spontaneously re-sort buttons and beads and other materials in the math area when they try storing the materials in partitioned boxes at clean-up time. There are often just not enough partitions for all the groups they have created, so they re-sort until they come up with the right number of groups.

Exercise 10: Identifying a set and one of its parts or subsets and comparing the part to the whole. Correctly recognizing that the whole is greater than the part.

This exercise explores the quantification involved in the problem of class inclusion. Comparing a part of a set to the whole provides an opportunity to exercise reversible operations of class inclusion. For example, children could be asked whether there are more boys on the bus or more people.

Exercise 11: Sorting objects into hierarchical systems of increasingly inclusive classes. Recognizing and identifying increasingly inclusive classes and comparing sub-classes to the whole.

Exercises ten and eleven both provide opportunities for the application of reversible schema. This last exercise in the sequence extends the addition of classes to several, inclusive classes. In this setting, the associative properties of class addition and subtraction can be explicitly explored. Classes are dealt with as entities whose relations to one another are inclusions which are additive, reversible and associative. For example, after one field trip children came up with the following classification of things they had seen on the trip:
Building -- schools, restaurants, the water tower and the bank.
Schools -- High school, Elementary school, and High/Scope schools.
High/Scope schools -- old High/Scope school and new High/Scope school.

Application

Kofsky found in a scalogram study of a similar sequence of classificatory behaviors that the sequence was only partially sequential (Kofsky 1966 in Sigel and Hooper 1968). Significant numbers of children studied were able to perform some tasks high on the sequence but were unable to perform lower level tasks. The exercises listed above are therefore not strictly sequential. They are not in the order they are acquired by every child.

In our experience the usefulness of the Piagetian theory is not dependent on the "rightness" of the sequences of the acquisition of sub-stage developmental abilities. Its value is that "classification" has enormous potential as content for a child's school experiences which gives teachers one broadly different way of evolving curriculum.

The intention of the High/Scope curriculum is not to teach children classification nor is it to speed up the acquisition of classificatory ability. If curriculum undertook to speed up or teach classification, a precise sequence would be quite important in the construction of instructional activities. The High/Scope curriculum intends to create a learning environment in which children learn from experiences they create through their interest in the world which surrounds them and their interaction with peers and adults.

Piagetian theory of classification is one important resource element in creating a learning environment. The theory is important because it defines a useful way of thinking about an area of intellectual

content of children's experience. The thinking behaviors listed in the sequence of exercises are things children can and should be doing. They are things a teacher can and should be planning.

When one abandons a search for the "right" sequence of acquisition, one still finds in Piaget's work helpful tools in planning children's experiences. The theory provides a description of behaviors in general categories which are entirely different from the behaviors which comprise the content of traditional education. Piaget offers ideas that may be used as a basis for designing school experiences for children which are focused not on the acquisition of skills or the internalization of factual information but on the development of universally innate potentialities.

The High/Scope curriculum is essentially for the teacher. It is the teacher's responsibility to create the environment in which appropriate experiences occur. It is also the role of the teacher to structure his expectations and interaction with children to provide opportunities for thinking processes to occur. Curriculum must guide teachers in their daily interaction with children. It must guide teachers in selecting materials for classroom use and in setting up routines for classroom operation.

For the classification exercises to be useful to a teacher, and specifically to include information that could be readily held in mind, the amount of information had to be limited. There are many more statements that could have been included in the list to indicate novelty in the activities, shades of meaning, or specific mention of reversibility. These would have made the list too long and unwieldy. A thick booklet with fifty or a hundred exercises would be forbidding and would lie tucked away and unused. The list had to be short.

Curriculum designed to help teachers create a learning environment in which children exercise classification abilities must concern itself with the relationship between classificatory abilities and the child's response to an environment where he makes decisions about what he is going to do. A child responds to a rich classroom environment not in pure categories of behavior but with a whole range of schemes and drives. A sequence of classification exercises can be helpful in structuring the classroom setting, asking questions and suggesting directions to a child that will maximize his use of classificatory abilities he already possesses.

The implications of the classification exercises for use in the classroom include setting up situations in which children are asked to classify, and identifying and extending incipient classification

activities children themselves generate. This is the practical essence of the theory of equilibration -- the generation of cognitive experience by the child's own action.

For example, each day children are asked to plan and carry out activities they themselves design. Materials are available in a variety of interest areas -- Math, Science, Book-making, Wood Construction, Art, Home. Some of these areas have been created by the children. Teachers plan with the children, then work with them in the interest areas. While the teacher works with the child he seeks to extend the child's activity so that opportunities for classification are used naturally by the child to complete his project.

When teachers evaluate their day, they identify projects children have begun and interests they have indicated. In making plans for the next day they provide additional materials and plan questions which will allow the child to extend his work but which also have the potential for classificatory exercises.

Consider the following example of child-teacher interaction which occurred while some children were building houses for gerbils.

Teacher: What are these things here?

Child A: Gerbils.

Teacher: Where are the babies?

Child A: Right here.

Teacher: Is there anything else in there besides the babies?

Child A: Mama and papa.

Teacher: Do you think there are more babies or are there more gerbils?

Child A: More babies.

Teacher: Let's see. (Turning to another child) What do you think?

Child B: There are more gerbils.

Teacher: You think there are more gerbils? Than what?

Child B: Than the babies because these five babies plus those other two are seven.

A summary of procedures for classroom use of classification exercises follows:

1) Teachers set out or control materials in interest centers that are conducive to sorting, arranging, comparing, combining.

2) Child chooses interest center, materials, and result he desires.

3) Teacher observes child and on the basis of what the child is doing extends the child's activity either through questions or suggestions of materials. The teacher explores several exercises but encourages the child to use one he is capable of to complete his project.

4) Teachers evaluate day considering what each child has done. Additional materials are set out as indicated by children's interests and the potential for the exercise of cognitive abilities.

The High/Scope curriculum is interested in logical thinking about something -- bridges to be built, ecological problems to be solved, thoughts and feelings to be represented, racial problems, and educational processes. Cognitive structures are important in that they provide for the articulation of experience. It is experience, in which developmental capacities are in active use, which is valuable to both society and the individual.

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